Climate change impacts to San Francisco Bay−Delta wetlands: Links to pelagic food webs and predictive responses based on landscape modeling

#0040

Technical Panel Review

Proposal Name: Climate change impacts to San Francisco Bay−Delta wetlands: Links to pelagic food webs and predictive responses based on landscape modeling

Applicant Organization: San Francisco State University

Principal Lead Investigator(s):
Parker, V. Thomas
Talley, Drew
Callaway, John
Kelly, Maggi

Amount Requested: $746,848

TSP Panel Summary of Findings:

The proposal offers a study that is highly relevant to the CalFED program. The techniques are state−of−the−art and no doubt will provide new information and insights into the wetlands of San Francisco Bay, estuary and Delta. The sampling program is ambitious but feasible and the data analysis appropriate to match the sampling program. The results of the study will provide a detailed understanding of six wetlands in San Francisco Bay, Estuary and Delta. The authors propose state−of−the−art methods to develop a new and deeper understanding of wetlands and some of their associated flora and fauna. The proposal suffers in making the connections to climate change as mentioned in the title, hypothesis and objectives. While there is an explicit statement to relate global change to impacts on San Francisco Bay wetlands, in reading the proposal one gets the impression that after all the data are collected and analyzed the relationships will be mostly correlative to produce loose inferences. The sampling program is set forth in good detail while the modeling is less precise and more of a "trust me" approach. The proposal did not provide a clear description of the tasks embedded within the study. None of these points are serious in what is an otherwise an excellent proposal from an outstanding research team. However, they do preclude a top rating for the proposal.

The combination of detailed measurements proposed will elevate our current knowledge of wetlands in the San Francisco Bay and will likely help the authors achieve their objectives set forth in the proposal.

The panel felt that the proposed effort is a long−time horizon approach to the Bay−Delta landscape reaction to systemic change as it affects basic properties of production of fresh−water, estuarine, and marine anadromous and catadromus fishes. With a long−time horizon such as proposed, the applicant should advise on how monitoring is to be conducted to detect the long−time horizon outcome. What should be measured to detect the reactions predicted? Perhaps this could be addressed in a separate paper following the conclusion of the proposed study.

Relevance to PSP Topic Areas:

High

TSP Technical Rating:
Above Average

TSP Funding Recommendation:
Fund w/conditions

TSP Amount Recommended: $**646,848**

Conditions:

The panel recommends reducing the overall budget by $100,000.

External Technical Review #1

Proposal Title: Climate change impacts to San Francisco Bay−Delta wetlands: Links to pelagic food webs and predictive responses based on landscape modeling

Proposal Number: 0040

Proposal Applicant: San Francisco State University

Purpose

Comments	**The goals, objectives and hypotheses are clear, consistent and timely. Background information is good and will be fortified by this proposed work. Modelling will mesh existing and new information in a worthwhile manner.**
Rating	**Above Average**

Background

Comments	**Yes, as stated above,background information is good and will be fortified by this proposed work.**
Rating	**Superior**

Approach

Comments	**The approach seems generally strong, but the jump to pelagic fishes seems somewhat questionable. Other aspects appear to be well supported by the assembled team.**
Rating	**Above Average**

Feasibility

Comments	**Again, scaling up to fisheries, as a major component of pelagic food webs, seems to the the weak link. Only two or three fish or macroinvertebrate species across six sites will be evaluated for stable isotopes. No**

	real understanding of sampling to characterize the fish communities is conveyed. Success at meeting goals 4 and 5 on page 2 is in doubt.
Rating	Above Average

Budget

Comments	It is not entirely clear how all the work in the proposal is distributed over four tasks in the budget: management, stable isotope analysis, wetland analyses, and modelling. Again fish work and expertise is not evident.
Rating	Above Average

Relevance To CALFED

Comments	The proposal scores high here, and is well focused at CALFED needs.
Rating	Superior

Qualifications

Comments	Again fish work and expertise is not evident--reliance on Peter Moyle is mentioned in passing.
Rating	Sufficient

Overall Evaluation Summary Rating

Comments	The stable isotope analysis, wetland analyses, and modelling will be useful but meeting all the goals stated on page 2 will be difficult. Fish will be a black box and the PIs evidence little understanding of fish community complexities and how species can compensate.
Rating	Above Average

External Technical Review #2

Proposal Title: Climate change impacts to San Francisco Bay−Delta wetlands: Links to pelagic food webs and predictive responses based on landscape modeling

Proposal Number: 0040

Proposal Applicant: San Francisco State University

Purpose

Comments	**The primary goal of this research is to understand the impact climate change will have on food webs in the SFB area. The approach is logical and proposes to develop a data base on the production of tidal wetlands along a salinity gradient and the relationship of nekton with those wetlands. This type of research, encompassing multiple components of a large estuary, is difficult because replication is necessary within any one salinity zone and because of the inherent variability within and among similar marshes. Nevertheless, the general approach is logical and information generated would be useful. Similar data from East and Gulf coast systems has taken decades to generate because of the necessity to evaluate temporal and spatial variation. Thus, the information may be extremely important, but not sufficient to generate meaningful models. While they do propose to evaluate sedimentation, episotic events are typically far more important than normal daily processes. In addtion, the dynamics within soils regulated by below−ground plant production and decomposition are extremely important with respect to maintenance of wetlands with sea level rise and are not evaluated. The installation of SETS would be extremely useful and add to the long−term value of the proposal.**
Rating	**Sufficient**

Background

Comments	The authors clearly have a good understanding of the basic relationships between fauna and marsh that have been studied in other parts of the world. As noted above, they have missed the role that below−ground production plays in elevation maintenance. Different plant species have differing abilities to deposit below−ground biomass and respond differently to increases salt and sulfide stress with respect to below−ground deposition. The only bothersome idea within the proposal was the concept that the role of tidal wetlands with respect to supporting nekton populations would be altered by a change in sea level. Louisiana tidal wetlands seem to contribute most as they are drowning and incidentally, gained a great deal of sediment from recent hurricanes making nomal measurements of sedimentation not very useful for modeling wetlands and sea level rise.
Rating	Sufficient

Approach

Comments	The overall approach is clear, but the importance of any modeling is overstated. Models with be interesting, but likely not useful in predicting what effect climate change will have on wetlands or nekton. The division of labor seems appropriate, although the plant portion is likley to be more work than anticipated based on budgets.
Rating	Sufficient

Feasibility

Comments	There was enough information provided to evaluate the proposal, although the section on use of stable isotopes was confusing. These data may not prove as useful as they expect. Other components are generally feasible, except for the predictiveness of any models developed as noted earlier.

Rating	**Sufficient**

Budget

Comments	**It is very difficult to evaluate costs at other institutions, especially in California. Some components seem overbudgeted, while others under. Generally, it is within what I would expect from a federal lab.**
Rating	**Sufficient**

Relevance To CALFED

Comments	**The question of salinity, finfish production and global climate change are important questions from more than just a management point. It is imperative that an understanding be developed before attempts are made to manipulate fish production by manipulating fresh water flows into SFB estuary. If everything that is proposed were collected there would be much that would be useful to scientists attempting to understand the linkages, but I am not sure that this would be helpful to CALFED except in a general sense.**
Rating	**Sufficient**

Qualifications

Comments	**My bet is that if this proposal were funded these scientists have the background and ability to generate good science that would enhance the knowledge base of the SFB estuary. My expectation is that some aspects of this work would continue and ultimately lead to the type and quantity of data needed to answer some of the questions of interest to CALFED.**
Rating	**Above Average**

Overall Evaluation Summary Rating

Comments	**The overall evaluation must be tempered by the fact that what is being proposed would be difficult to accomplish with the proposed time frame, but still extremely valuable science and important to future resource managers and scientists. Understanding the Barataria bay, LA estuary took more than a decade and millions of dollars. It was only after that time that an understanding of trophic linkages sufficient to generate realistic predictive models was possible. This proposal offers to begin the process of generating the kinds of data necessary to ultimately generate such a model, thus my overall evaluation is higher than previous evaluations related to specific questions of this proposal.**
Rating	**Above Average**

External Technical Review #3

Proposal Title: Climate change impacts to San Francisco Bay−Delta wetlands: Links to pelagic food webs and predictive responses based on landscape modeling

Proposal Number: 0040

Proposal Applicant: San Francisco State University

Purpose

Comments	**This project brings together a strong team of wetland scientists with complimentary strengths in wetland fish food webs and habitat connectivity, marsh accretion and erosion processes, wetland plant community assessment, community−based landscape monitoring, and spatial modeling. Note that representative publications for most of the project team are not included, although web links are provided to access this information. The proposal is well written and organized, with clearly stated questions and objectives, although the description of project deliverables lacks detail on specific task outcomes. The proposal builds in part on previous collaboration by three team members for a CalFed project to develop wetland assessment methods. The project's overall hypothesis states that the Bay Delta pelagic fish community is linked to tidal wetlands, that wetlands are likely to experience negative change, and that this change would lead to negative response by the fish community. More specific hypotheses could have been suggested for each part of this hypothesis. Linkages between wetlands and fish are not well described for California, except for previous work by team member D. Talley. There is no question that the project will add greatly to the ecological understanding of Bay Delta aquatic ecosystems, especially regarding fish use of these habitats. Given the abundant differences between California tidal wetlands, and east coast tidal wetlands, there is a**

	high likelihood that the fish−wetland interactions investigated in this project will lead to novel findings. The proposed models of wetland change in response to anthropogenic drivers, and concomitant change in the fish community parameters, will be of great value in guiding the management and restoration of these precious and threatened ecosystems. However, the mechanism whereby project findings are conveyed to conservation and management organizations is not well defined in this proposal.
Rating	Superior

Background

Comments	The concept that changes in salinity and inundation patterns will affect wetland ecology is clearly presented; although the nature of the interaction between these factors is presented loosely through a series of three figures for which minimal description is provided. A similar comment pertains to the figure depicting the relation between fish community parameters and wetland productivity, where the rationale behind the depicted threshold is not provided. An elegant conceptual framework linking tidal wetland plant diversity, productivity and salinity is presented, and the six study marshes are chosen specifically to investigate this relationship, using replicate freshwater tidal, brackish and saline marshes. Ample documentation is provided to support and justify these concepts and their associated research objectives. The authors should note the work of Brian Silliman in Georgia showing that substantial wetland plant production is directly consumed by snails. Two recent dissertations and associated publications would also provide useful information: Caitlin Mullan Crain, Brown University 2006 (Pattern and process in coastal marsh processes across estuarine salinity gradients), and Raymond Konisky, University of New Hampshire 2003 (Spatial modeling and visualization of habitat response to hydrologic restoration in New England salt marshes).

Rating	**Superior**

Approach

Comments	**There are several strengths in the design and methodology of this study worth mentioning: 1) the collection of high resolution elevation data with which to model tidal inundation patterns, 2) the multiple study sites spanning the salinity gradient of interest, 3) the inclusion of sediment deposition and organic decomposition measurements, and 4) the judicious use of Sulfur isotopes to increase separation among species with overlapping C and N isotope signatures. The study is well designed to support the ambitious predictive spatial modeling effort proposed, which includes comparison of results between three different spatial modeling techniques. The model will be of invaluable use to any group involved in the protection and management of the Bay Delta's precious wetlands, although the proposal does not outline specific outreach or tech transfer activities. The subject of contributing data to larger data management systems does not appear to be addressed.**
Rating	**Above Average**

Feasibility

Comments	**The sediment deposition, plant decomposition studies are fully documented and will use standard techniques. The measurement of emergent plant ANPP will use a relatively new, non−destructive method now being verified by the project team. Plant sampling is described in good detail and is also technically feasible and will provide very useful information. The fish food web methodology is also standard and capable of good success, especially with the measurement of S isotope data as needed. The fish species of interest are yet to be determined. If migratory species are selected, tissue samples should be taken long enough**

	after the arrival of a particular migrant species such that its tissues adequately reflect the energy sources of its current surroundings. It would be instructive to compare energy signatures between migrant and resident species groups. It would also be instructive to compare energy signatures of native fishes and non−native fishes. The scale of the project is appropriate for the stated objectives, and the authors have a well−informed grasp of all study components: design, field and lab methods, data analysis, and modeling.
Rating	**Superior**

Budget

Comments	**The breakdown of the budget seems reasonable, and the one large−ticket item, the RTK GPS is essential for successful completion of the project. The support of a full time graduate student for three years is a plus, as is the support for undergraduate assistants. Two members of the project team are providing their time at no cost (D. Talley, M. Kelly). USF is contributing $55, 545 of support for J. Callaway. Support for technicians, supplies, and overhead all seem very reasonable. The total amount budgeted for stable isotope analysis is $56,550, although only $19,000 is actually used for the lab analyses, and $1700 for equipment and supplies, as explained in the budget justification. This would leave more than $35,000 for sample prep and travel, which seems high.**
Rating	**Above Average**

Relevance To CALFED

Comments	**This proposal seems tailor made to address PSP priority topics 3) Trends and Patterns of Populations and System Response to a Changing Environment, and 4)**

	Habitat Availability and Response to Change for the six study marshes. The project will integrate the key abiotic and biotic components and processes of wetland ecosystems, and will build on existing relevant data. In addition, the predictive spatial model can be applied to many other wetlands in the Bay Delta for which adequate input data exist. The authors provide a detailed list of PSP questions of interest that will be addressed by the project: driver/response relationships; management implications of species response; descriptive models of system drivers; effect of climate change scenarios on habitat; spatial response of drivers to climate change scenarios, and effects on key species. **The project team represents a strong collaboration of wetland ecologists representing the essential sub disciplines and a landscape modeler. The products of the proposed study will most certainly be of value to resource managers (for fish and wetland management, wetland restoration) and policy makers (for land and water use policy), as long as it is presented in a usable form. Peer−reviewed publications are not an effective way to communicate scientific results to these groups.**
Rating	**Superior**

Qualifications

Comments	**The project team is very well qualified to carry out the proposed work. This project is a clear and logical progression that builds on previous work by group members, including other CALFED funded projects. Excellent facilities are available at each participating institution, and there is ample computing power for model development and testing.**
Rating	**Superior**

Overall Evaluation Summary Rating

Comments	**This proposal draws together data on the primary abiotic (hydrology, sediment, elevation) and biotic (plant diversity, ANPP, fish and their prey) components of tidal wetlands. These data will be used to test important hypotheses about hydrology and salinity as drivers of wetland plant communities, the relationship between plant diversity and ANPP, and wetland−fish linkages. A detailed spatial model will be developed to predict changes in these relationships in response to climate change scenarios.** **The proposal speaks directly to PSP topics 3 and 4 (population and ecosystem response to climate change, habitat availability and response to change). The six member team plus graduate and undergraduate assistants provide appropriate human resources for the project's substantial scope. Although there is no explicit tie to resource management outlined in the proposal, the many individual ties to management and conservation groups held by team members will inevitably lead to some level of outcome dissemination.**
Rating	**Superior**

External Technical Review #4

Proposal Title: Climate change impacts to San Francisco Bay−Delta wetlands: Links to pelagic food webs and predictive responses based on landscape modeling

Proposal Number: 0040

Proposal Applicant: San Francisco State University

Purpose

Comments	**This is a very strong proposal with a very good group of interdisciplinary scientists. The overall goal of looking at changes in salinity, sedimentation and food web dynamics as a function of changing precipitation patterns and sea level rise is a very timely one and proposed for one of the most important estuarine systems nationwide. The hypotheses and goals are achievable with the methods and approaches proposed.**
Rating	**Above Average**

Background

Comments	**The conceptual model is largely huristic in nature but does provide a conceptual basis for the linkage between the freshwater and marine food webs.**
Rating	**Sufficient**

Approach

Comments	**The work plan is well layed out and clearly shows which PI's are responsible for each task. The budget seems reasonable for the objectives as layed out. The public outreach portion of the proposal is a bit weak, but there are a variety of public dissemination approaches**

	proposed.
Rating	**Sufficient**

Feasibility

Comments	**this is a very strong proposal with technically answerable questions. The techniques that are proposed are well tried and will almost certainly provide the information needed to answer the proposed questions. I might suggest more information be collected (or represented if it exists)for the spatial distribution of the fish community.**
Rating	**Above Average**

Budget

Comments	**The budget seems well thought out and is appropriate for the work proposed.**
Rating	**Above Average**

Relevance To CALFED

Comments	**The san francisco bay system is a central ecological and economic component of the Pacific coast of the US. This proposal is central to many of the priority research areas recognized by the CALFED program. The research team represents a strong balance of many disciplines with important synthetic findings from this research an almost certainty.**
Rating	**Superior**

Qualifications

Comments	**The investigators represent a very strong interdicsiplinary group, well suited to address the questions proposed. they all have established track records in their particular areas of expertise and should provide a cohesive, synthetic team.**
Rating	

	Above Average

Overall Evaluation Summary Rating

Comments	**This proposal should be funded given the proposed questions, research team in place and the importance of the questions to the California economy and ecology.**
Rating	**Above Average**